

# James E. Baker

+1(916) 663-8022 – jaba1428@colorado.edu

## EDUCATION

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### University of Colorado Boulder – Boulder, CO

In Progress

Doctor of Philosophy – Chemical Engineering

### Saint Louis University – Saint Louis, MO

Aug 2025

Master of Science Engineering, Concentration in Biomedical Engineering

- 4.00/4.00 GPA
- Advisor: Dr. Silviya Zustiak
- Thesis: Hydrogel Platforms for Investigating the Effects of Matrix Stiffness and Hyaluronic Acid on Hepatocellular Carcinoma In Vitro

### Saint Louis University – Saint Louis, MO

May 2024

Bachelor of Science Electrical Engineering, Concentration in Bioelectronics

- 3.90/4.00 GPA, Summa Cum Laude

## RESEARCH EXPERIENCE

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### Saint Louis University – Biomedical Engineering Master's Student Research

Aug 2023-Aug 2025

- Synthesizing piezoelectric hydrogels for promoting proliferation in muscle and nervous cells in-vitro
- Developing a device for the detection of electric currents produced in hydrogels undergoing mechanical deformation
- Designing dual condition hydrogel microenvironments for the interrogation of glioblastoma multiforme motility and drug response in vitro
- Determining how hyaluronic acid and matrix stiffness drive hepatocellular carcinoma invasion

### Swiss NCCR Bio-Inspired Materials Internship – Summer Research Intern

June 2023-Aug 2023

- Selected to participate in the Swiss National Center of Competence in Research Bio-Inspired Materials Internship at the Adolphe Merkle Institute in Fribourg, CH
- Investigated selective-ion transport across polymer membranes for electrical power generation via reverse electrodialysis
- Analyzed electrical and transport properties of functionalized polymer block co-polymer membranes and a commercially available proton exchange membrane
- Gained experience with membrane self-assembly methods and an aqueous two-phase system for analyzing polymer membranes on a small scale

### Saint Louis University – Biology Department Research Assistant

May 2021-May 2023

- Conduct experiments to further understanding of regulators of G protein-coupled receptors
- Proficiency for reading and analyzing scientific literature
- Critical thinking and reasoning skills for analyzing data
- Learned and mastered molecular techniques for analyzing DNA and proteins
- Wrote and Received a Grant in Aid of Research from Sigma Xi

### Department of Veteran Affairs – Summer Research Intern

May 2022-Aug 2022

- Selected to participate in the Wen H. Ko Summer Internship Program with the Cleveland VA Medical Center and Case Western Reserve University
- Developed a wearable monitor that will estimate the amount of energy used by a lower-limb amputee during daily living outside of the laboratory setting
- Utilized Python to program a microcontroller (Raspberry Pi)
- Interfaced with and analyzed data from Inertial Measurement Units
- Designed hardware implementation of this wearable system to be worn by an individual with a lower limb amputation outside of the laboratory

## TECHNICAL SKILLS

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### Languages

- American Sign Language (California Seal of Biliteracy)

### Wet Laboratory

- Biology
  - TCA protein extraction, E. coli genome transformation, yeast genome transformation, halo assay, polymerase chain reaction, SDS-PAGE electrophoresis, genome cloning and plasmid design
- Engineering
  - Dialysis, UV polymerization, 2D/3D cell culture techniques, hydrogel fabrication, lyophilization, confocal microscopy, rheology

### Coding

- MATLAB, Python

## PUBLICATIONS, PRESENTATIONS, & POSTERS

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Faber, A., Nejat, S., **Baker, J.**, Zustiak, S.P. “Dual-stiffness hydrogel-based glioblastoma in vitro model to observe cell behavior at interfaces”, *Tissue Engineering Part C* (accepted for publication)

Pierucci, C., Paleari, L., **Baker, J.**, Sproncken, C., Folkesson, M., Wesseler, J., Vracar, A., Dodero, A., Nanni, F., Berrocal, J.A., Mayer, M., Ianiro, A. “Nafion membranes for power generation from physiologic ion gradients”, *Royal Society of Chemistry, Applied Polymers* (2025)

National Biomedical Engineering Society Conference 2024

- Selected to give an oral presentation entitled “Measuring Electric Currents from Piezoelectric Hydrogel Substrates for Excitable Cells” at the 2024 National Biomedical Engineering Society Conference in Baltimore, MD

Saint Louis University Institute for Drug and Biotherapeutic Innovation Research Symposium 2024

- Selected to present a poster entitled “Development of an in vitro polyethylene glycol dual stiffness hydrogel model to observe glioblastoma spheroid motility at stiffness interfaces” at the 2024 Saint Louis University Institute for Drug and Biotherapeutic Innovation Research Symposium

Saint Louis University Sigma Xi Research Symposium 2024

- Selected to present a poster entitled “Measuring Electric Currents from Piezoelectric Hydrogels” at the 2024 Sigma Xi Scientific Research Honor Society Symposium hosted by the Saint Louis University chapter

National Biomedical Engineering Society Conference 2022

- Selected to present a poster entitled “Wearable System for Estimating Energy Expenditure in Lower Limb Amputees” at the 2022 National Biomedical Engineering Society Conference in San Antonio, TX.

American Society for Biochemistry and Molecular Biology Conference 2022

- Selected to present a poster “Identification of Novel Regulators for GPCR-signaling via Genome-wide Analysis” at the 2022 American Society for Biochemistry and Molecular Biology Conference in Philadelphia, PA.

## RESEARCH PROJECTS

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- Identification of Novel Regulators for GPCR-Signaling via Genome Wide Analysis of *S. Cerevisiae*
  - Wrote and received a Grant in Aid of Research from Sigma Xi to help fund this project
- Wearable System for Estimating Energy Expenditure in Lower-Limb Amputees
- Nafion Membranes for Power Generation from Physiological Ion Gradients
- Selective Ion Transport Across Synthetic Polymer Membranes
- Piezoelectric Hydrogels as Scaffolds for Electrically Excitable Cells
- Dual Stiffness Hydrogels for Observing Glioblastoma Motility at Stiffness Interfaces In Vitro

- Exploring the Effects of Hyaluronic Acid and Matrix Stiffness on Hepatocellular Carcinoma Invasion

## **RESEARCH INTRESTS**

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- In vitro hydrogel modeling of cell-cell and cell-matrix interactions
- Regenerative engineering
- Drug delivery
- Drug screening
- Biomimetic biomaterials

## **COMMUNITY ENGAGEMENT**

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### **Revitalization 2000, Inc**

Jan 2024-Aug 2025

- Engaging with members of the underserved and historic Ville neighborhood in Saint Louis as a resident of the Claver House
- Helping to address food insecurity in The Ville through maintaining a community garden and helping manage food distribution events twice a month
- Helping to increase science literacy in youth in the neighborhood through afterschool and Saturday morning educational programing

### **Saint Benedict Joseph Labre Ministry with the Homeless**

Sept 2021-May 2024

- Served homecooked meals to individuals experiencing homelessness as a means of establishing connections with these individuals